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Invited Article

Occupational Injury Prevention Research in NIOSH

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This paper provided a brief summary of the current strategic goals, activities, and impacts of the NIOSH (National Institute for Occupational Safety and Health) occupational injury research program. Three primary drivers (injury database, stakeholder input, and staff capacity) were used to define NIOSH research focuses to maximize relevance and impact of the NIOSH injury-prevention-research program. Injury data, strategic goals, program activities, and research impacts were presented with a focus on prevention of four leading causes of workplace injury and death in the US: motor vehicle incidents, falls, workplace violence, and machine and industrial vehicle incidents. This paper showcased selected priority goals, activities, and impacts of the NIOSH injury prevention program. The NIOSH contribution to the overall decrease in fatalities and injuries is reinforced by decreases in specific goal areas. There were also many intermediate outcomes that are on a direct path to preventing injuries, such as new safety regulations and standards, safer technology and products, and improved worker safety training. The outcomes serve as an excellent foundation to stimulate further research and worldwide partnership to address global workplace injury problems.

Key Words: Vehicle, Fall, Violence, Machine, Strategic goal

Introduction

The World Health Organization estimated that 45,696,000 work-related injuries and 142,000 fatalities occur worldwide each year [1]. The incidents not only result in suffering and hardship for the workers and their families, but also add costs to the global community due to productivity loss and medical and other expenses. As the Federal organization responsible for conducting research for the prevention of work-related injuries in the U.S., NIOSH has been conducting a premier research program for several decades. To maximize relevance and impact of the injury-prevention-research program, NIOSH relies on three primary drivers. First, the research priorities address the leading causes of occupational injuries and deaths and highest risk industries and worker populations. Second, stakeholders' input and partnership are required components to assure effective research impacts. Third, internal expertise and capacity to carry the work through in a timely fashion is critical to the program planning and impact as well. The sections below on Occupational Injury Data, Strategic Goals, and Program Activities describe the program based on the abovementioned drivers.

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Occupational Injury Data

A total of 5,214 fatal occupational injuries were recorded in the United States in 2008, as reported by the Census of Fatal Occupational Injuries [2]. The most frequent event or exposure for these fatalities was transportation incidents (2,130), contact with objects and equipment (937), assaults and violent acts (816), and falls (700). The leading causes of these incidents were motor vehicle highway incidents (1,215; 23%), falls (700;

13%), workplace violence (526; 10%), and machine and industrial vehicle incidents (520; 10%). Of the 1215 motor vehicle highway incidents, 29% occurred in truck transportation, 6% in construction specialty trade, and 5% in merchant wholesale. Of the 700 fatal falls, 48% occurred in the construction sector and 32% in the service sector; 18% of the 700 falls involved falls from roofs, 17% from ladders, 13% from non-moving vehicle, and 13% on same level. Of the 526 workplace violence incidents, 22% occurred in the retail trade and 14% in food services and drinking places. Of the machine and industrial vehicle incidents, 12% occurred during special trade construction and 12% during crop production.

In addition, there were an estimated 1,078,140 nonfatal occupational injuries in private industry in 2008 [3]. The most common nonfatal injury causes were machine and industrial vehicle incidents (291,880), falls (260,610), overexertion (250,960), and motor vehicle incidents (48,610). Of the machine and industrial vehicle incidents, 10% (28,100) occurred in construction specialty trade and 7% (20,610) in merchant wholesale. Of the fall incidents, the highest frequency of falls to lower level occurred in the construction specialty trade (11,110) followed by truck transportation (3,790), while the highest frequency of falls on same level occurred in hospitals and nursing care facilities (24,490) followed by food services and drinking places (11,250).

Strategic Goals

Using an injury-data-driven approach with input from stakeholders, NIOSH has developed strategic goals, concentrating on the leading causes of occupational injury mortality in the U.S., to ensure that we would be focusing on the most important injury problems. We also developed sub-goals specific to high-risk industry or occupation groups, where research efforts are most needed. Four priority overarching strategic goals for the next decade are described below - reducing occupational injuries and deaths due to motor vehicles, falls, violence, and machines and industrial vehicles.

Reduce occupational injuries and deaths due to motor vehicle incidents

- Strategic Subgoal 1: Industries and companies will incorporate effective interventions into their policies and procedures to reduce motor-vehicle-related incidents and crashes among professional drivers (e.g., long- and short-haul truckers, day delivery and taxi drivers).
- Strategic Subgoal 2: The road construction industry will incorporate effective interventions into their policies and procedures to reduce injuries and deaths due to vehicle and equipment related struck-by incidents.
- Strategic Subgoal 3: Industry will incorporate effective interventions into their policies and procedures to reduce motor-vehicle-related incidents and crashes among public safety and emergency response workers.
- Strategic Subgoal 4: Global partners will collaborate to develop strategies for reducing occupational road traffic injuries worldwide.

Reduce fall injuries in the workplace

- Strategic Subgoal 1: Reduce fall injuries in the construction industry.
- Strategic Subgoal 2: Reduce fall injuries in the health services industry.
- Strategic Subgoal 3: Reduce fall injuries in the wholesale and retail trade industry.
- Strategic Subgoal 4: Reduce fall injuries in the public safety, services, manufacturing, and other high risk industries.
- Strategic Subgoal 5: Reduce fall injuries through research on human characteristics and on biotechnology-based fall control measures.

Reduce occupational injuries and deaths due to workplace violence

- Strategic Subgoal 1: Reduce occupational injuries and deaths due to workplace violence among taxicab drivers.
- Strategic Subgoal 2: Reduce workplace violence among high risk retail trade workers including grocery stores, gasoline stations, convenience stores, bakeries, liquor stores, and other shops and businesses at risk of robbery.
- Strategic Subgoal 3: Identify risk factors and effective interventions to prevent workplace violence among high risk services, health care, social service, and public safety sector workers.

Reduce injuries and deaths due to machines and industrial vehicles

- Strategic Subgoal 1: Reduce occupational injuries and deaths in industries at high risk for mobile machine and industrial vehicle overturns.
- Strategic Subgoal 2: Reduce occupational injuries and deaths in industries at high risk for mobile machine and industrial vehicle non-overturn events.
- Strategic Subgoal 3: Reduce occupational injuries and deaths in industries at high risk for stationary machine entanglements.
- Strategic Subgoal 4: Reduce occupational injuries and

deaths due to machines and industrial vehicles through the identification of new hazards and risk factors.

Program Activities

One way to "picture" the strategic goals is to look at program and project activities. Three selected project activities for each overarching strategic goal are summarized below to elaborate the strategic goals; these projects coincide with NIOSH existing internal expertise and capacity.

Reduce occupational injuries and deaths due to motor vehicle incidents

Motor vehicle safety initiative

The NIOSH Motor Vehicle Safety Initiative coordinates NIOSH-wide activities to reduce motor vehicle-related incidents. It currently supports three efforts: (1) global road safety initiatives, including a collaborative project in India to deliver workshops to employers and training to drivers, and activities supporting a UN General Assembly resolution proclaiming a "Decade of Action for Road Safety 2011-2020"; (2) support of National Occupational Research Agenda (NORA) goals related to motor vehicle safety, including an effort to identify fleet safety program elements, and intramural/extramural efforts to meet high priority NORA needs; and (3) research addressing vehicle struck-by incidents in road construction work zones.

Improved truck cab design through applied anthropometry

This project establishes an anthropometric and workspace database for the U.S. truck drivers. The database will be used to update and develop standards for new generation truck cabs with sound ergonomic designs. Ergonomically sound cabs will help increase truck drivers' visibility, comfort, seat belt use and post-crash survivability, thus reducing their exposure to fatal and non-fatal injuries.

Partnering with industry to build safe EMS work environments

This project builds on previous NIOSH research aimed at reducing vehicle-crash-related injuries and fatalities to emergency medical service (EMS) workers in ambulance patient compartments. NIOSH will use the wealth of research data generated on predecessor projects to directly influence changes to the General Services Administration's Federal Specification for the Star-of-Life Ambulance which largely governs the design of all ambulances purchased by the U.S. government and most state and local entities.

Reduce fall injuries in the workplace

Effectiveness of extension-ladder safety innovations

This research is developing and evaluating the effectiveness of extension-ladder-safety innovations, e.g., a multimodal inclination indicator and multifunctional convertible ladder-top stabilizers and walkthrough devices. A graphic-oriented practical user's guide on ladder use, maintenance, and inspection will also be developed and evaluated by focus groups and trainers at partner sites. The project results will be transferred to manufacturing partners for product adaptation and advancement, to reduce the risk of fall injury for millions of ladder users across many industries.

Fall injury controls and interventions for aerial lifts

This study is to identify fall protection strategies and recommend effective intervention programs to workers who are at risk of injury from work at elevation on aerial lifts. The outputs of this project will provide information associated with fall protection systems to aerial-lift and fall-protection-system standards committees and manufacturers.

Evaluation of slips, trips, and falls (STF) prevention practices in food services

This research evaluates the efficacy of STF prevention practices, with a focus on slip-resistant shoes and optimal floor cleaning, for reducing the incidence of STF-related injuries in food services. Because of the large size of the food services industry (~10 million workers) and the high rates of STFs, NIOSH has developed a goal to reduce the frequency of injuries by 30% among food service workers by 2015.

Reduce occupational injuries and deaths due to workplace violence

Workplace violence initiative: research and implementation

This project is to support and coordinate the conduct of new research in the area of workplace violence prevention, including a Federal Interagency Task Force on Workplace Violence Research and Prevention, evaluation of cameras used in the taxicab industry, a survey of taxicab drivers on safety camera use, and a study in New Jersey related to implementation of the Violence Prevention in Health Care Facilities Act.

Evaluation of workplace violence safety ordinances for taxi drivers

The project is evaluating workplace violence prevention strategies with a focus on taxi drivers and the effectiveness of safety equipment. The Multi-City study will produce guidelines for taxi-camera use in the taxi industry and guidelines for city

safety ordinances written for taxi drivers, which would also promote adoption of city ordinances in cities without such ordinances and thus a reduction in taxi driver violence.

Community-based violence intervention for businesses at high risk of robbery

This study examines the effectiveness of recruitment strategies used by the Oxnard Police Department (OPD) on participation in the Workplace Violence Prevention Program (WVPP) and compliance with program components. In addition, a process evaluation of the police and community partner experiences in disseminating the WVPP into businesses at high risk for robbery in the city of Oxnard, CA will be conducted. These findings have the potential of being used to translate the WVPP from Oxnard to other cities throughout the country.

Reduce injuries and deaths due to machines and industrial vehicles

Fatality assessment and control evaluation

The purpose of the Fatality Assessment and Control Evaluation (FACE) project is to identify work environments which place workers at high risk for fatal injury, identify potential risk factors, and formulate and disseminate prevention strategies to those who can intervene in the workplace. Investigation findings and prevention recommendations are incorporated into health communication documents for broad dissemination and are used by employers to increase worker safety, by manufacturers to modify machinery and equipment to increase worker safety, and by the Occupational Safety and Health Administration (OSHA) and other organizations in the promulgation of safety standards and compliance directives.

Increasing adoption of CROPS by farmers and manufacturers

This project is to identify barriers from and approaches for stimulating farmers to retrofit their tractors with Cost-Effective Roll-Over Protection Structures (CROPS) using stakeholder input. The findings from this work will be incorporated into existing social marketing strategies developed through the National Agricultural Tractor Safety Initiative. It will also serve as a starting point to develop other marketing initiatives to increase the adoption rate of CROPS.

Work zone safety

This project evaluates effectiveness of selected injury prevention measures (i.e., internal traffic control plans and a variety of proximity warning devices) that construction contractors can use to protect workers from being struck by construction vehicles and equipment operating inside work spaces of roadway construction projects. If proven to be effective, adoption of these interventions throughout the construction industry could substantially reduce exposure of workers to moving construction vehicles and equipment, thus reducing fatalities and injuries related to vehicles and equipment by nearly 50%.

Impact

One way we work to ensure the impact of our research is through strategies to transfer the results of our research to the workplace or to the next step towards workplace implementation. For each research project, we identify at least one stakeholder or "recipient" of the findings. We involve the recipients from the conceptual phase of the research onward, and request to their input. This not only helps us to ensure that the products will be relevant and acceptable to workers, but also promotes shared ownership or buy-in by the stakeholders. At the conclusion of the research, we facilitate the recipient in carrying out the next step in moving the research results towards workplace implementation. Examples of the various types of research-to-practice (r2p) recipients include: translators of scientific information to worker-friendly guidance or training materials; regulators and employers to promulgate new safety policy; consensus standards bodies to develop or modify guidelines and voluntary standards; trade and labor organizations to promote new safety practices; manufacturers to develop and market safety technologies; and companies to implement new processes and practices to prevent injuries among their workforce. Each project described in the Program Activities section includes at least one type of the r2p recipients.

NIOSH strives for the ultimate outcome of preventing injuries. While it is a major challenge to demonstrate a cause-effect relationship between our research and injury metrics, we believe that our efforts during the past 2 decades on addressing leading causes of injuries have made a substantial contribution toward an overall decline in the number (7% reduction) and rate (17% reduction) of fatal injuries among the U.S. workforce from 1996-2005 [4,5]. We expect that the new focused strategic subgoals will further our mission in reducing occupational injuries for the next decade.

Summary

This paper summarizes selected priority goals, activities, and impacts of the NIOSH occupational injury research program with a focus on prevention of the four leading causes of workplace injury and death in the U.S. The NIOSH contribution to the overall decrease in fatalities and injuries is reinforced

by decreases in specific goal areas where we had concentrated efforts. For instance, deaths due to homicide decreased a significant 39% from 1996-2005 [6]. The proposed new and focused strategic subgoals for the next decade are anticipated to further our mission in occupational injury and death reduction. In addition to end outcomes of reductions in injuries and deaths, there were also many intermediate outcomes, or results or actions that are on a direct path to preventing injuries, such as new safety regulations and standards, safer technology and products, new and improved worker safety training, and the stimulation of further research. We invite you to review this strategic plan in detail on our website (http://www.cdc.gov/niosh/injury/pdfs/TIFinalStrategicPlanFinalwebpostAppendixOnly.pdf or http://www.cdc.gov/niosh/injury) and to contact us (HHsiao@cdc.gov and NStout@cdc.gov) if you are conducting research or making progress in any of these areas that we might benefit from collaboration or sharing of results.

Disclaimer

The findings and conclusions are those of the authors and do not necessarily represent the views of NIOSH. Mention of any products does not constitute the endorsement of NIOSH.

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